User Guide

Site Survey Tool for DECT

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Disclaimer

1   Introduction

1.1   About the Site Survey Tool

The Site Survey Tool is used by technicians to plan base station locations for a DECT telephone system with TDM-DECT or IPBS base stations. With the Site Survey Tool you can determine the required number and positions of base stations.

By using the Site Survey Tool and one or two base stations, the radio coverage of a base station can be determined. Two base stations are required when IPBS base stations are used and if air sync is considered.

A connection with a PBX is not required when using the Site Survey Tool. The Site Survey Tool is available in two versions. One with battery units and chargers. And one without battery units and chargers.

1.2   Components of the Site Survey Tool with Battery Units and Chargers

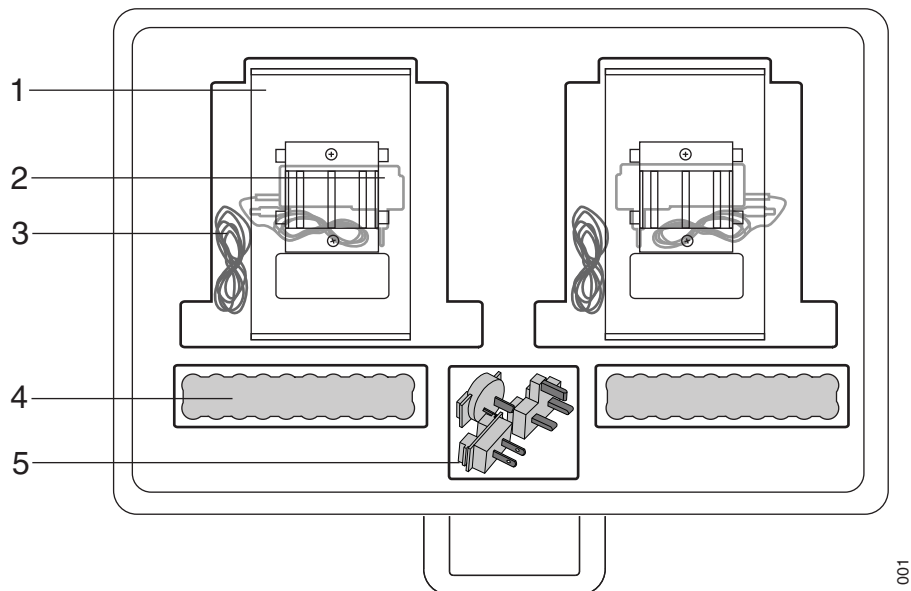Figure 1. Site Survey Tool: case and components

The Site Survey Tool consists of:

- Two carrying sets (1)
- Two battery unit chargers (2)
- Two 5m battery patch cables (3)
- Two battery units (4)
- Interchangeable plug attachments (EU, UK, AU+US) (5)
- User Guide
- Carrying case

1.3   Components of the Site Survey Tool without Battery Units and Chargers

The Site Survey Tool consists of:

- Two carrying sets
- Two 5m battery patch cables
- Two 0,5 m cable with DC plug
- User Guide
- Carrying case

1.4 Technical Data with Battery Units and Chargers

Battery operating time	3 hours
Battery charging time	12 hours (approx.)
Battery life cycle	Charge/discharge count = 1000 (min.)
Supported base stations	IPBS1 and IPBS2

1.5 Technical Data without Battery Units and Chargers

Supported base stations	IPBS4x0 and IPBS4x2

1.6 Restrictions

The Site Survey Tool does not conform to intrinsic safety specifications. Never use the tool in potentially explosive environments.

The Site Survey Tool is intended for indoor use only. Outdoor use may damage the tool.

IMPORTANT: When a 5 m battery patch cable is connected to the base station, the base station must not be connected to ethernet.

1.7 Specifications

Operating temperature	0 - 40°C
Storage temperature	-20 - +70°C
Relative humidity	10 to 80%, non-condensing

1.8 Use of Handsets

This user´s guide assumes that you are familiar with the use of handsets. If necessary, see the handset user´s guide.

2 Preparations for Use

2.1 Charging the Battery (Only for Version with Battery Units and Chargers)

Charge the battery units with the supplied chargers for approximately 12 hours.

A fully charged battery offers about 8 hours of operation. When the battery voltage becomes too low, the site survey base station stops operating,

The battery unit and the site survey base station are connected with the included battery patch cable.

The battery charger is supplied with a number of interchangeable plug attachments for different countries. The correct plug attachment for the intended country of use must be fitted as follows:

1   If necessary, remove the Central European plug attachment.

2   Select the correct plug attachment for the intended country of use.

3   Slide the plug attachment onto the charger. Check that the connection is correct and secure.

2.2 Connections to External Power Supply (Only for Version without Battery Units and Chargers)

Use the DC plug cable and connect the red and black cables to a suitable DC power source.

Operating voltage: 21 to 56 Vdc

Power consumption: 4W

2.3 Mounting the Site Survey Base Station

The mechanical assembly protects the base station against mechanical shocks and enables it to be placed in the following ways:

•   Hanging, for instance on a door using the carrying sets
•   Mounted on a pole with the mounting clip delivered with the base station
•   Use the carrying sets fastened to a tripod

NOTE: The battery unit must be placed on a flat surface. Do not hang the battery unit in the patch cable.

3 The Site Survey Tool in the Handset

The Site Survey Tool in the handset provides two major features; indications of radio signal quality and base station listing.

Radio signal quality involves both signal strength and frame error rate. This tool may be used when planning a site's radio coverage and to find radio quality problems.

Base stations lists may include all base stations within range of the phone, sorted in signal strength order. This feature may be used to find other interfering DECT base stations.

3.1 Access to the Menu

There is a direct access to the Site survey tool menu by entering the code *#77# in idle mode. See figure 2 and figure 3 on page 5.

The Site survey tool menu can also be permanently available in the menu by following the steps below.

Aastra DT4x2 DECT Telephones

The permanent appearance in the menu is controlled by the SIM parameter Settings. Test function enabled. The SIM parameter can be set by the SIM Card Programmer or by entering a lock-up code and activating the test-functions. To enter the lock-up code navigate to the General settings menu and press 40022. A special menu will appear, enable the test functions by selecting the change option.

The Site survey tool menu (see figure 2) is now permanently available, it is found pressing the Menu button, navigate to Settings -> System. A sub menu called Site survey tool is found as the last entry in the System screen.

NOTE: When having the test functions enabled the Hot-key functionality is replaced with test functions. To retrieve normal behaviour press 40022 in the General settings and disable the test functions.
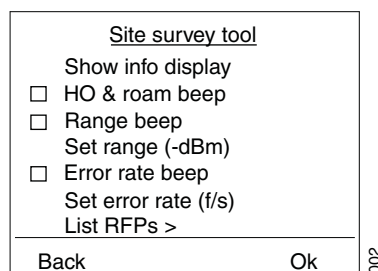
```
        ┌──────────────────────────────┐
        │        Site survey tool      │
        │      Show info display       │
        │   ☐  HO & roam beep          │
        │   ☐  Range beep              │
        │      Set range (-dBm)        │
        │   ☐  Error rate beep         │
        │      Set error rate (f/s)    │
        │      List RFPs >             │
        ├──────────────────────────────┤
        │   Back                Ok     │
        └──────────────────────────────┘
```

Figure 2. Site survey tool menu items in DT4x2.

Aastra DT69x/DT4x3 DECT Telephones

1   Press the soft key "Menu" and select Calls > Call time.

2   Press the keys ">*<<*<" An Admin menu will appear.

3   Select "Site survey tool.

The Site survey tool menu is now permanently available, it is found pressing the soft key "Menu", and selecting Calls > Admin menu > Site survey tool.

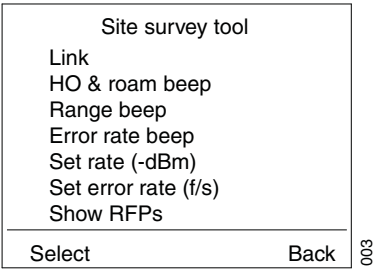NOTE: The Admin menu is available until the handset is restarted.

```
               Site survey tool
        Link
        HO & roam beep
        Range beep
        Error rate beep
        Set rate (-dBm)
        Set error rate (f/s)
        Show RFPs
        _____
        Select              Back    003
```

Figure 3. Site survey tool menu items in DT69x, and DT4x3.

3.2 Activate Information Display

Aastra DT4x2 DECT Telephones

The first item in the Site survey tool menu is Show info display. Pressing the right soft-key will active and deactivate the Information display as a pop-up screen.

```
               Site survey tool

        9004025B05 T
        -56 dBm   00f/s


        List RFPs >                  004
```
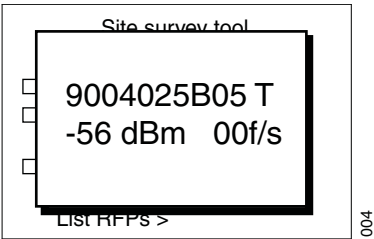
Figure 4. Information display in DT4x2.

The first row in the dialog window shows the RFPI of the base station that the handset is synchronized to. A letter T indicates that a traffic bearer is active and the handset is transmitting data. The second row shows the signal strength and the amounts of bad frames per second.

Aastra DT69x/DT4x3 DECT Telephones

The first item in the Site survey tool menu is Link that shows information described below.

NOTE: If the Admin menu is enabled, it is also possible to view link information during a call by pressing the soft key "More" and then selecting "DECT Info"> "Link".
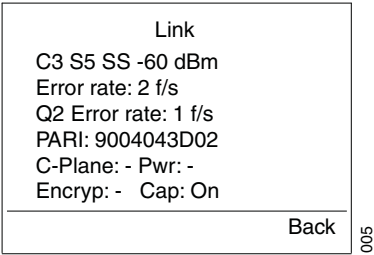
```
                  Link
        C3 S5 SS -60 dBm
        Error rate: 2 f/s
        Q2 Error rate: 1 f/s
        PARI: 9004043D02
        C-Plane: - Pwr: -
        Encryp: -  Cap: On
        _____
                            Back    005
```

Figure 5. Information display in DT69x, and DT4x3.

First row

Shows the current carrier (C), slot (S) and signal strength (SS).

Second row

Shows the amounts of bad frames per second which are received by the handset.

Third row

Shows during an active call the amount of bad frames per second that are received by the base station.

Fourth row

Shows the PARI that uniquely identifies the base station that the handset is synchronized to.

Fifth row

C-plane - shows the current speed rate that is used for transmitting data. Slow rate is indicated by CS, and fast rate is indicated by CF.

Pwr - shows the output power transmitted by the handset.
LP: , US: , EU: .

Sixth row

Encypt - shows if the established call is encrypted (On) or not (Off). If an hyphen is displayed (-), no call is established.

Cap - shows if the base station(s) has the capability to encrypt calls. If the status is "On", encryption is possible. Otherwise, "Off" is displayed.

3.3   Activate Hand-Over and Roam Beep

The handset can be set to indicate base station switches. The different hand-overs and roaming are indicated according to the table.

Base station switch type	Beep signal type	Comment
Roaming	Tow low-pitch beeps	Handset is idle
Inter cell hand-over	One high-pitch beep	Played as in-band tone
Intra cell hand-over	One low-pitch beep	Played as in-band tone
External hand-over	Two low-pitch beeps	Played as in-band tone

Aastra DT4x2 DECT Telephones

Activate hand-over and roam beep by marking the "HO & roam beep" checkbox in the site survey tool menu. Press the right soft key to mark/unmark the checkbox.

Aastra DT69x/DT4x3 DECT Telephones

Activate hand-over and roam beep by selecting "HO & roam beep" in the site survey tool menu, and then select "On". Select "Off" to deactivate the hand-over and roam beep.

3.4   Activate Signal Strength Range Beep and Set Range Level

The handset can be set to indicate when the signal strength to any base station drops below a certain level. When the signal strength drops below the level, a special beep signal and the red status LED is activated.

Aastra DT4x2 DECT Telephones

1   Select "Set range".

2 Set range level (-68 dBm).

3 Press "OK".

4 Activate range beep by marking the "Range beep" checkbox in the site survey tool menu. Press the right soft key to mark/unmark the checkbox.

Aastra DT69x/DT4x3 DECT Telephones

1 Select "Set range".

2 Set range level (-68 dBm).

3 Press "Save".

4 Select "Range beep".

5 Select "On" to activate the range beep.

3.5 Activate Frame Error Rate Beep

The amount of bad frames per second may also trigger a beep signal (signal is identical to the range beep). A frame is considered bad if no sync word is found, or if the A-field CRC is incorrect. There are a total of 100 frames per second, and when the amount of bad frames exceeds the preset value for one second or more, a special beep signal and the red status LED is activated.

Aastra DT4x2 DECT Telephones

1 Select "Set error rate (f/s)".

2 Set error rate level (2 f/s).

3 Press "OK".

4 Activate error rate beep by marking the "Error rate beep" checkbox in the site survey tool menu. Press the right soft key to mark/unmark the checkbox.

Aastra DT69x/DT4x3 DECT Telephones

1 Select "Set error rate (f/s)".

2 Set error rate level (2 f/s).

3 Press "Save".

4 Select "Error rate beep".

5 Select "On" to activate the error rate beep.

3.6 Base Station Listing

The sub menu List RFPs for the DT4x2 (see figure 6 on page 8) and Show RFPs for DT69x, and DT4x3 (see figure 7 on page 8) give possibilities to scan the air for base stations and sort them in order of signal strength - strongest first.

Four different lists are available. The first list is All / All RFPs which will display all DECT base stations found. With the Selected / Selected RFPs list, a special system may be selected, just enter the PARK for that system. In the same way a special system may be excluded with Hide selected / All except selected. The Residential / Residential RFPs list will contain residential base stations only.

Each list may contain up to 64 base stations. The number of base station hits may vary by time, thus several scan cycles may be needed to find all base stations.
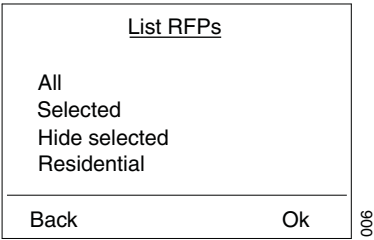
```
                 List RFPs


     All
     Selected
     Hide selected
     Residential


     Back                    Ok
```

Figure 6. Base station listing menu in DT4x2.

```
                Show RFPs
     All RFPs
     Selected RFPs
     All except selected
     Residential RFPs
     Select                 Back
```
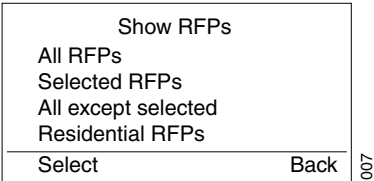
Figure 7. Base station listing menu in DT69x, and DT4x3.

In DT4x2, press the soft key "OK" and then press the right soft key "Scan" for making a list over all RFPs. After 20 seconds the list will appear. Scroll the list with the Navigation key. From the left; a counter, RFPI, and signal strength are displayed (see figure 8).

```
                   All

     01: 9004025E07  -58dBm
     02: 9004085A05  -58dBm
     03: 9004085A02  -60dBm
     04: 1000805001  -62dBm


     Back                   Scan
```
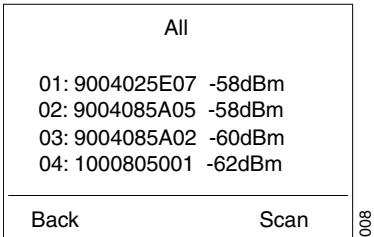
Figure 8. A base station list for all RFPs n DT4x2.

In DT69x, and DT4x3; press the soft key "Select" for making a list over all RFPs. Scroll the list with the Navigation key. From the left; a counter, signal strength, and RFPI are displayed (see figure 9).

```
                 All RFPs
     Nr dBm  RFPI
     01 -58   9004025E07
     02 -58   9004085A05
     03 -60   9004085A02
     04 -62   1000805001


     Stop                   Back
```
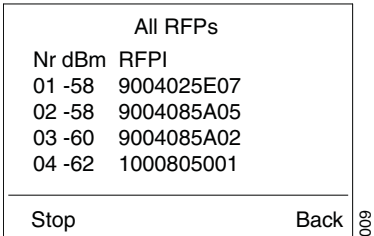
Figure 9. A base station list for all RFPs in DT69x, and DT4x3.

4 Site Survey with IPBS Base Station

If the planned system shall have an IPBS, both speech coverage and sync coverage have to be considered. If the system only consists of IPBL, only speech coverage has to be considered.

Speech coverage: the radius of the circle (circular radiation patterns of the IPBS antennas are assumed for reasons of simplicity), around a particular IPBS, in which portable parts can communicate with that IPBS, see figure 10.

Sync coverage: the radius of the circle, around a particular IPBS, in which other IPBSs can synchronize with that IPBS with a given synchronization loss probability. This means that the size of the sync radius depends on requested probability of losing synchronization, see figure 10.

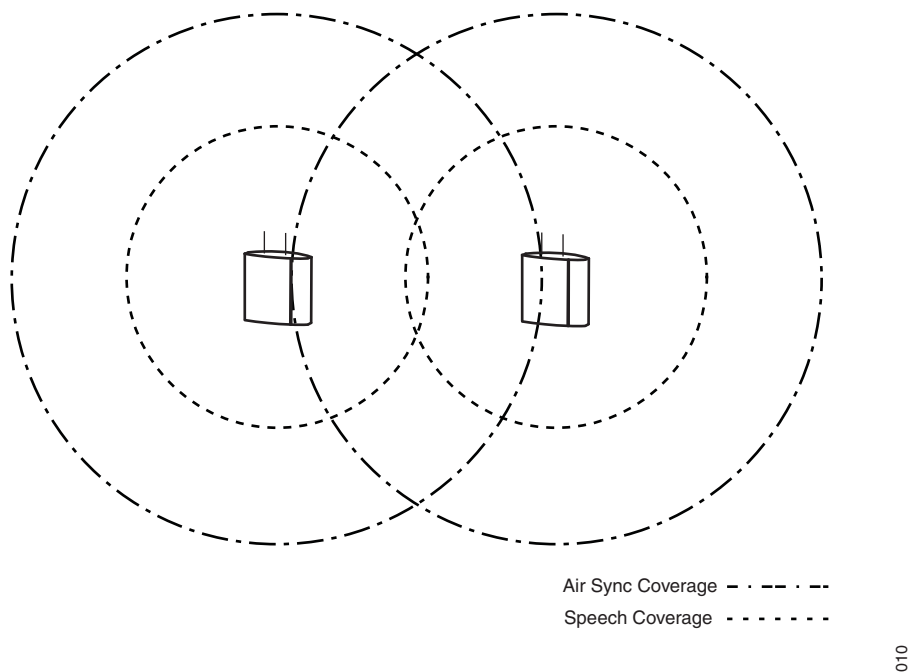Air Sync Coverage – · –– · ––
Speech Coverage - - - - - - - -

010

Figure 10. Air- and speech sync radius.

4.1 Start By Placing Two Base Stations in the Site

Use the GUI web interface to configure IPBSs. For more information about the GUI web interface, see the document *Installation and Operation Manual for IP-DECT Base Station.*

1 Set base station A in deployment mode.

2 Set base station A as Sync Master.

3 Register one DECT handset in base station A.

4 Set base station B in deployment mode. Use the same system ID as for base station A.

5 Set base station B as Sync Slave.

6 Base station A shall be placed the first time on the planned location for the Sync Master (should be in the middle of the site).

4.2 Check the Speech Coverage for Base Station A

7   Check on the DECT handset that the signal strength is > -68 dBm which is the normal case to get sufficient speech quality within each base station.

8   Verify that the speech quality is sufficient by listening on a call. When the off-hook key is pressed, the speech is looped back. However, when the off-hook key is pressed on an anonymous DECT handset a dial tone is heard and when a digit is pressed the speech is looped back.
In certain environments, for example reflective environments (large rooms with lots of metal), there might be a need for a considerable stronger signal strength more than -68 dBm in order to get sufficient speech quality.

9   Mark on a map the position and the speech coverage for base station A.

4.3 Check the Synchronization Coverage

10   Use the GUI web interface on base station B and check that the signal strength from base station A to base station B is stronger than -83 dBm. If this is not the case then you should consider to move base station B closer to base station A to get a stable synchronization coverage for a longer time.

For IPBS4x0: You can also check the synchronization by looking at LED2 (upper LED) on the base station IPBS4x0, see figure 11. For a description of LED2 deployment indications, see the diagram in figure 12 on page 11. When indicating no sync (LED flashing red) it might take some additional time (10 to 30 seconds) to regain synchronization when entering the sync coverage again.

For IPBS4x2: You can also check the synchronization by looking at the LED on the base station IPBS4x2, see figure 13 on page 11. For a description of LED deployment indications, see the diagram in figure 14 on page 11. When indicating no sync (LED flashing red and yellow) it might take some additional time (10 to 30 seconds) to regain synchronization when entering the sync coverage again.
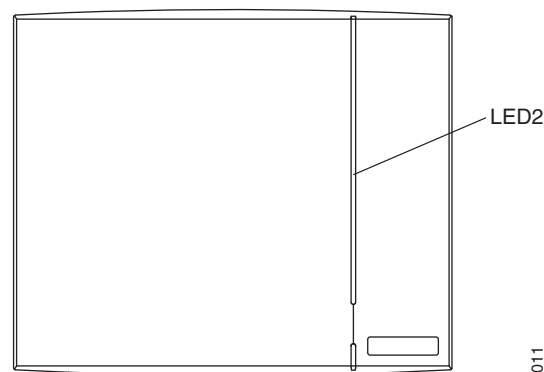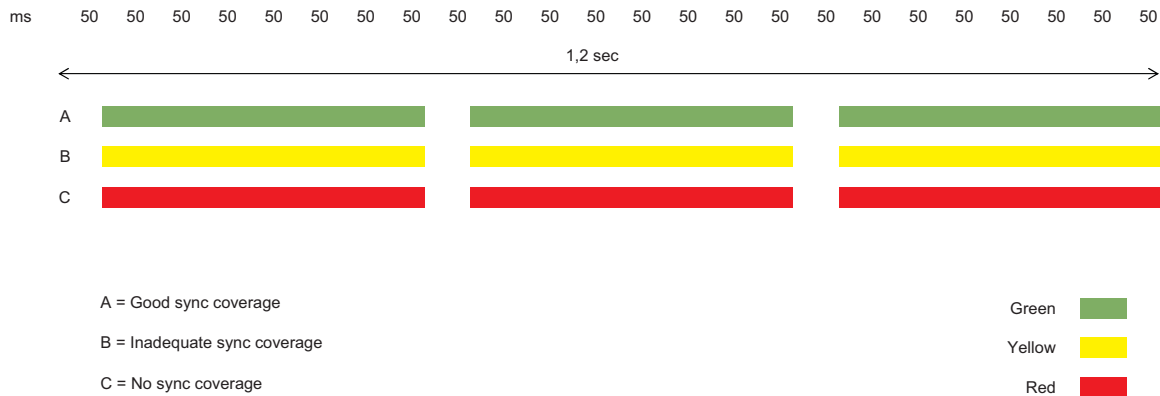
Figure 11. LED2 on the IPBS4x0.

ms	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

1,2 sec

A

B

C

A = Good sync coverage

B = Inadequate sync coverage

C = No sync coverage

Green

Yellow

Red

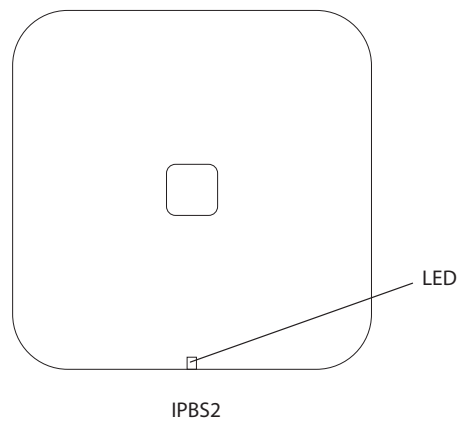Figure 12. LED2 deployment indications

LED

IPBS2

Figure 13. LED on IPBS4x2.

Deployment: Good sync	2000 ms blue, 400 ms yellow.	The IPBS4x2 is in deployment mode and has good air sync coverage.
Deployment: Bad sync	400 ms blue, 600 ms off, 400 ms blue, 600 ms off, 400 ms yellow.	The IPBS4x2 is in deployment mode and does not have adequate air sync coverage.
Deployment: No sync	2000 ms red, 400 ms yellow.	The IPBS4x2 is in deployment mode and has no air sync coverage.

Figure 14. LED deployment indications on IPBS4x2.

11   Use the GUI web interface on base station B and check the signal strength on the actual synchronization coverage and name it X.

12   Perform an RFP scan. If there are other DECT systems that are stronger than (X-6) dBm, move base station B closer to base station A and then repeat from step 10 above. For

example, if X = -80 dBm then there must be no other DECT systems that are stronger than -86 dBm.

4.4 To Perform Measurements for Other Base Stations

13 Move base station A to the position where base station B is located.

14 Place base station B on the next planned position.

15 Repeat from step 7 above.

5 Broadcast and Multicast Messaging

Special requirements need to be considered when planning a system for broadcast and multicast messaging.

Broadcast and multicast messages are without any handshake procedure between the base stations and the handsets instead a number of retransmissions are being made to increase the probability of a complete transmission. The sending application receives a confirmation that the message has been sent and received by the radio exchange/base stations but not the handsets.

Advantage of sending broadcast/multicast messages:

- Quick transmission to a large number of users
- Low system capacity usage

Disadvantage of sending broadcast/multicast messages:

- No individual technical confirmation, thus lower security

An appropriate value for installations where broadcast and multicast shall be used is to always have field strength above -65dBm.

Document History

For details, see change bars in the document

Version	Date	Description
A	12 December 2012	First version